

# WATER SUPPLY OUTLOOK FOR WESTERN UNITED STATES

## Including Columbia River Drainage in Canada

and

FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS

UNITED STATES DEPARTMENT of AGRICULTURE···SOIL CONSERVATION SERVICE
Collaborating with
CALIFORNIA DEPARTMENT of WATER RESOURCES
and
BRITISH COLUMBIA DEPARTMENT of
LANDS, FORESTS and WATER RESOURCES

AS OF
**FEB. 1, 1969**

## TO RECIPIENTS OF WATER SUPPLY OUTLOOK REPORTS:

Most of the usable water in western states originates as mountain snowfall. This snowfall accumulates during the winter and spring, several months before the snow melts and appeors as streamflow. Since the runoff from precipitation as snow is deloyed, estimates of snowmelt runoff can be made well in advance of its occurrence. Streamflow forecasts published in this report are based principally on measurement of the water equivalent of the mountain snowpack.

Forecasts become more accurate as more of the data affecting runoff are measured. All forecasts assume that climatic factors during the remainder of the snow accumulation and melt season will interact with a resultant average effect on runoff. Early season forecasts are therefore subject to a greater change than those made on later dates.

The snow course measurement is obtained by sampling snow depth and water equivalent at surveyed and marked locations in mountoin areas. A total of about ten samples are taken at each location. The average of these are reported as snow depth and woter equivalent. These meosurements are repeated in the same location near the same dates each year.

Snow surveys are made monthly or semi-monthly from January 1 through June 1 in most states. There are about 1400 snow courses in Western United States and in the Columbia Basin in British Columbia. In the near future, it is anticipated that automatic snow woter equivalent sensing devices along with radio telemetry will provide a continuous record of snow water equivalent at key locotions.

Detoiled data on snow course and soil moisture measurements are presented in state and locol reports. Other data on reservoir storage, summaries of precipitation, current streamflow, and soil moisture conditions at valley elevations are also included. The report for Western United States presents a broad picture of water supply outlook conditions, including selected streamflow forecasts, summary of snow accumulation to date, and storage in larger reservoirs.

Snow survey and soil moisture data for the period of record are published by the Soil Conservation Service by states about every five years. Data for the current year is summarized in a West-wide basic data summary and published about October 1 of each year.

## PUBLISHED BY SOIL CONSERVATION SERVICE

The Soil Conservation Service publishes reports following the principal snow survey dates from Jonuary 1 through June 1 in cooperation with stote water administrators, agricultural experiment stations and others. Copies of the reports for Western United Stotes and all state reports moy be obtained from Soil Conservation Service, Western Regional Technical Service Center, Room 209, 701 N. W. Glisan, Portland, Oregon 97209.

Copies of stote and local reports may also be obtoined from state offices of the Soil Conservation Service in the following states:

| STATE | ADDRESS |
|---|---|
| Alaska | P. O. Box "F", Palmer, Alaska 99645 |
| Arizona | 6029 Federal Building, Phoenix, Arizona 85205 |
| Colorado (N. Mex.) | 12417 Federal Building, Denver, Colorado 80521 |
| Idaho | P. O. Box 38, Boise, Idaho 83707 |
| Montana | P. O. Box 98, Bozeman, Montana 59715 |
| Nevado | P. O. Box 4850, Reno Nevado 89505 |
| Oregon | 1218 S. W. Washington St., Portland, Oregon 97205 |
| Utoh | 4012 Federal Building, Salt Lake City, Utah 84111 |
| Woshington | 360 U.S. Court House, Spokane, Washington 99201 |
| Wyoming | P. O. Box 340, Casper, Wyoming 82602 |

## PUBLISHED BY OTHER AGENCIES

Water Supply Outlook reports prepared by other agencies include a report for California by the Water Supply Forecast and Snow Surveys Unit, California Department of Water Resources, P. O. Box 388 , Sacramento , California 95802 --- and for British Columbia by the Department of Lands, Forests and Water Resources, Water Resources Service, Parliament Building, Victoria, British Columbia


USDA-SCS-PORTLAND, OREG. 1966

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## Including Columbia River Drainage in Canada

ISSUED

FEBRUARY 1, 1969

The Soil Conservation Service coordinates snow surveys conducted by its staff and many cooperators, including the Bureau of Reclamation, Corps of Engineers, Forest Service, National Park Service, Weather Bureau, Geological Survey, and other Federal Agencies, Departments of State Government, Irrigation Districts, Power Companies, and others.

The Department of Water Resources coordinates snow surveys in California.

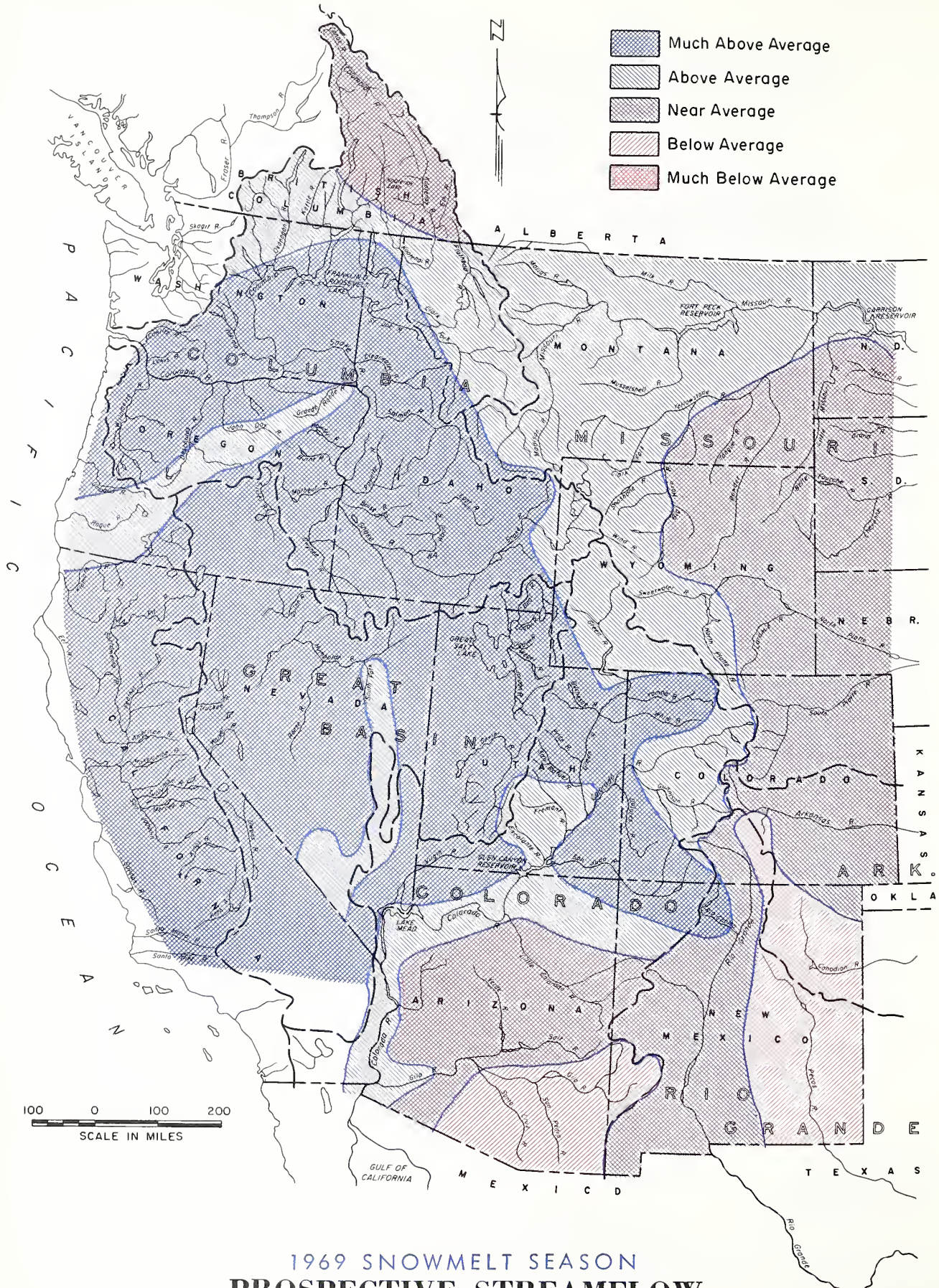
The Water Resources Service, Department of Lands, Forests, and Water Resources directs snow surveys in British Columbia.

This report was prepared by the Water Supply Forecasting Branch, Engineering Division, Soil Conservation Service, from data supplied by Snow Survey Supervisors of the Soil Conservation Service in the States of Alaska, Arizona, Colorado and New Mexico, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming.

Data from California was supplied by the Chief, Water Supply Forecast and Snow Survey Unit, Department of Water Resources.

Data from British Columbia was supplied by the Chief, Hydrology Division, Water Investigations Branch, Department of Lands, Forests and Water Resources.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
KENNETH E. GRANT, ADMINISTRATOR




1969 SNOWMELT SEASON

# PROSPECTIVE STREAMFLOW

As of February 1, 1969

USDA-SCS-PORTLAND, OREG. 1968

# WATER SUPPLY OUTLOOK

1969 SNOWMELT SEASON
AS OF FEBRUARY 1, 1969

NEAR OR ABOVE RECORD FEBRUARY 1ST SNOWPACKS AND EXCELLENT RESERVOIR STORAGE PROMISE GOOD TO EXCELLENT WATER SUPPLIES NEXT SUMMER FOR MOST OF THE WEST. ABOVE NORMAL SNOWFALL IS NEEDED DURING THE REMAINDER OF THE SNOW ACCUMULATION SEASON TO ASSURE ADEQUATE SUPPLIES IN THE ARKANSAS BASIN OF COLORADO, THE CANADIAN AND PECOS RIVERS IN EASTERN NEW MEXICO, AND ALONG ARIZONA'S GILA RIVER.

January storms laid an abnormally heavy blanket of snow on top of an already above average snowpack throughout most of the West. The result is one of the heaviest snowpacks in history for this time of year, with record to near record amounts on many watersheds of the Cascades and Sierra mountains in Washington, Oregon and California, and in parts of Nevada, Utah and Idaho.

Very cold temperatures during January not only prevented a normal amount of snowmelt from low elevations and valley floors, but also resulted in excessive snowfall in areas ordinarily experiencing rain. The combined result is such an extremely heavy low elevation snowpack that late winter-early spring runoff, even under the best of conditions, is expected to be damaging in many areas.

Numerous snow courses throughout the Columbia and Great Basins and in California already equal and in some cases considerably exceed their normal April 1st accumulation.

The California Department of Water Resources reports that the snowpack and other factors affecting water supply potential in California are well above normal for this date. Snow course measurements indicate that the snowpack in Sierra and Cascade watersheds is about twice normal for this date, with water contents ranging from 100 percent to 200 percent of April 1 average.

While the snowpack is heavy in the United States portion of the Columbia Basin, it falls off to about average amounts on the Upper Columbia and Kootenay rivers in British Columbia. Montana's snowpack varies from 130-150 percent on the Columbia river side of the Continental Divide to about 140 to over 200 percent on the Missouri river. Montana may also experience problems from its low elevation snows.

The snowpack decreases to the south in Wyoming, but is still near 20 to 30 percent above average on the upper Snake, Green, Shoshone, Wind and Bear rivers. It is near average in eastern parts of the state. In Colorado, streams east of the Continental Divide have a generally near or above average snowpack, except on the southern tributaries of the Arkansas river where it is only about three-fourths normal.

In New Mexico the Rio Grande river has an average or better snowpack. Additional snow is needed on the Canadian and Pecos rivers. The Upper Colorado river has one of its best snowpacks in years. The snow varies from about 120-160 percent in Wyoming and Colorado to over 200 percent on some Utah tributaries. All parts of the Upper Basin have prospects of an excellent water supply next summer. Prospects for water and power interests in the Lower Basin are also good, with inflow to Lake Powell forecast at near 25 percent above average.

With storage in Arizona's principal reservoirs varying from 2 to 5 times average amounts, a good water supply is assured for all areas except along the Gila river where some shortages may develop unless subsequent storms are heavier than normal.

Storage in principal irrigation reservoirs is near average or above in all states of the West except New Mexico and Oregon. Exceptions include reservoirs along the Arkansas river (30 percent of normal storage) and on the Canadian river (75 percent).

## SUMMARY OF SNOW WATER EQUIVALENT MEASUREMENTS FEBRUARY 1, 1969

| MAJOR BASIN AND SUB—WATERSHED | WATER EQUIVALENT IN PERCENT OF: LAST YEAR | AVERAGE |
|---|---|---|
| **MISSOURI BASIN** | | |
| Jefferson | 160 | 210 |
| Madison | 152 | 173 |
| Gallatin | 88 | 138 |
| Missouri Main Stem | 110 | 174 |
| Yellowstone | 137 | 140 |
| Shoshone | 169 | 131 |
| Wind | 116 | 122 |
| North Platte | 114 | 117 |
| South Platte | 98 | 101 |
| **ARKANSAS BASIN** | | |
| Arkansas | 118 | 116 |
| Canadian | 152 | 120 |
| **RIO GRANDE BASIN** | | |
| Rio Grande (Colo.) | 100 | 110 |
| Rio Grande abv. Otowi Bridge | 139 | 140 |
| Pecos | 71 | 95 |
| **COLORADO BASIN** | | |
| Green (Wyo.) | 154 | 117 |
| Yampa - White | 123 | 133 |
| Duchesne | 171 | 159 |
| Price | 191 | 191 |
| Upper Colorado | 116 | 125 |
| Gunnison | 140 | 120 |
| San Juan | 118 | 141 |
| Dolores | 113 | 149 |
| Virgin | 161 | 230 |
| Gila | 24 | 102 |
| Salt | 39 | 126 |
| **GREAT BASIN** | | |
| Bear | 185 | 129 |
| Logan | 160 | 112 |
| Ogden | 195 | 147 |
| Weber | 187 | 163 |
| Provo - Utah Lake | 180 | 179 |
| Jordan | 182 | 155 |
| Sevier | 117 | 160 |
| Walker - Carson | 339 | 229 |
| Tahoe - Truckee | 195 | 228 |
| Humboldt | 228 | 145 |
| Lake Co. (Oregon) | 205 | 195 |
| Harney Basin (Oregon) | 273 | 154 |
| **UPPER COLUMBIA BASIN** | | |
| Columbia (Canada) | 120 | 100 |
| Kootenai | 124 | 111 |
| Clark Fork | 138 | 146 |
| Bitterroot | 155 | 143 |
| Flathead | 153 | 129 |
| Spokane | 189 | 150 |
| Okanogan | 115 | 127 |
| Methow | 126 | 143 |
| Chelan | 149 | 131 |
| Wenatchee | 251 | 155 |

| MAJOR BASIN AND SUB—WATERSHED | WATER EQUIVALENT IN PERCENT OF: LAST YEAR | AVERAGE |
|---|---|---|
| **SNAKE BASIN** | | |
| Snake above Jackson, Wyo. | 141 | 130 |
| Snake above Hiese, Idaho | 139 | 130 |
| Snake abv. American Falls Res. | 147 | 143 |
| Henry's Fork | 182 | 186 |
| Southern Idaho Tributaries | 217 | 132 |
| Big and Little Wood | 235 | 195 |
| Boise | 245 | 165 |
| Owyhee | 559 | 189 |
| Payette | 213 | 158 |
| Malheur | 242 | 153 |
| Weiser | 170 | 140 |
| Burnt | 144 | 130 |
| Powder | 150 | 139 |
| Salmon | 185 | 155 |
| Grande Ronde | 188 | 125 |
| Clearwater | 190 | 150 |
| **LOWER COLUMBIA BASIN** | | |
| Yakima | 243 | 159 |
| Umatilla | 329 | 145 |
| John Day | 206 | 132 |
| Deschutes - Crooked | 205 | 138 |
| Hood | 387 | 227 |
| Willamette | 274 | 188 |
| Lewis | 155 | 161 |
| Cowlitz | 189 | 142 |
| **PACIFIC COASTAL BASIN** | | |
| Puget Sound | 246 | 139 |
| Olympic Peninsula | 145 | 120 |
| Umpqua - Rogue | 216 | 166 |
| Klamath | 218 | 168 |
| Trinity | 480 | 240 |
| **CALIFORNIA CENTRAL VALLEY** | | |
| Upper Sacramento | 400 | 220 |
| Feather | 520 | 260 |
| Yuba | 535 | 240 |
| American | 620 | 250 |
| Mokelumne | 710 | 250 |
| Stanislaus | 755 | 265 |
| Tuolumne | 740 | 260 |
| Merced | 770 | 270 |
| San Joaquin | 800 | 280 |
| Kings | 775 | 310 |
| Kaweah | 970 | 340 |
| Tule | 400 | 200 |
| Kern | 935 | 280 |

*Data for California Watersheds supplied by Dept. of Water Resources, and for British Columbia Watersheds by Dept. of Lands, Forests and Water Resources.*

*Average is for* 1953-67 *period.* California averages are for the period 1931-65.
*Based on Selected Snow Courses determined by Distribution within the Basin, Length of Record and Repetitive Monthly Measurement Schedules.*

## MISSOURI BASIN

Snowfall on the upper Missouri river and its tributaries in Montana has been exceptionally heavy during the first part of the snow accumulation season. The present snowpack ranges from about 140 percent of average on the Yellowstone and Gallatin rivers to over 210 percent on the Jefferson river. In many areas the snowpack has already exceeded the average for April 1, giving tentative assurance of an adequate water supply for next summer even if snowfall for the remainder of the season should fall below normal. Carryover storage in Montana's reservoirs is also well above average.

The snowpack decreases to the south in Wyoming, but is still above average with amounts ranging from about 115 percent on the North Platte to 130 percent on the Shoshone river.

In Colorado the watersheds of the South Platte have an average snow cover. Moisture in the soils underlying the snowpack is above average in Montana and is near normal or above in Colorado and Wyoming.

The flow of streams in Montana is expected to range from about 110 percent to 130 percent of average, with some of the smaller streams such as the Red Rock and Beaverhead rivers exceeding these amounts.

In Wyoming, the flow of the Shoshone, Wind and North Platte rivers is expected to be near 20 percent to 30 percent above normal. Snow cover is less favorable on the Big Horn mountains and in eastern Wyoming, where the Powder, Belle Fouche and Laramie rivers are expected to yield near average amounts. Carryover storage in the major reservoirs of Wyoming is improved over last year and is well above the February 1 average. Storage in the North Platte system is 117 percent of normal.

Carryover storage on the South Platte river system is 118 percent of normal and will provide a good supplement to the present prospect of a near normal runoff.

## ARKANSAS BASIN

The main headwaters of the Arkansas river have a normal or above snowpack. However, the situation is less favorable on its southern tributaries, the Cucharas and Purgatoire where the snowpack is only about 75 percent of the usual amount. While mountain soil moisture is about normal, valley soils would be benefited by additional storms.

Reservoirs in the Arkansas Basin contain only 30 percent of their normal amount of storage. In New Mexico, storage in Conchas reservoir on the Canadian river is down to 75 percent of normal.

Considering the depleted reservoir storage conditions, an above normal snowpack accumulation for the balance of the season is needed to guarantee adequate water supplies for next summer.

## RIO GRANDE BASIN

The snowpack varies considerably over the watersheds of the Rio Grande Basin. On the upper headwaters in Colorado it is only a few percent above normal, but increases sharply to the south on the Conejos and Rio Chama rivers where it is near 40 percent above usual amounts. To the east, on the Sangre de Cristo mountains the snow cover falls off to near three-fourths of average. Soil moisture conditions are good, being average or better.

Flow of the Rio Grande near Del Norte is expected to be near average, but inflow to the river system will be improved considerably by contributions from the Conejos and Rio Chama rivers which are expected to yield 40 to 50 percent more than their usual amounts. Surface water supplies for the Pecos are less favorable, with near 20 percent less than normal expected.

While carryover storage on the mainstem of the Rio Grande is slightly less than average, it is considerably better than last year at this time. Elephant Butte reservoir contains almost 100,000 acre-feet more than a year ago.

## COLORADO BASIN

The present snowpack is one of the best the watersheds of the Upper Colorado river have experienced this early in the year. Snow cover in Colorado and Wyoming varies from about 120 to 160 percent of average, with the heaviest amounts percentagewise lying on the Dolores and San Juan rivers. A record to near record snowpack was measured on many of Utah's tributary streams, with many areas reporting a snow cover that equals or exceeds April 1st averages.

The above average snowpack, combined with soil moisture conditions which are near average or above in most areas, provide an excellent water supply outlook for all parts of the Upper Colorado Basin during the coming summer. Storage in irrigation reservoirs is also above average. Storage in Lake Powell and other major reservoirs in the

## SELECTED STREAMFLOW FORECASTS APRIL - SEPTEMBER as of FEBRUARY 1, 1969

| STREAM AND STATION | 1000 ACRE-FEET | | PERCENT OF AVERAGE |
|---|---|---|---|
| | FLOW | FORECAST | |
| UPPER MISSOURI | 1969 | 1969 | 1969 |
| Jefferson at Sappington, Montana | | | |
| Madison near Grayling, Montana 1/ | | | |
| Gallatin near Gateway, Montana | | | |
| Missouri near Zortman, Montana 2/ | | | |
| Sun at Gibson Dam, Montana 3/ | | | |
| Marias near Shelby, Montana 4/ | | | |
| Milk near Eastern Crossing, Montana | | | |
| Yellowstone at Yellowstone Lake Outlet, Wyo.(Apr-Oct.) | | 1000 | 120 |
| Yellowstone at Corwin Springs, Montana | 2083 | 2300 | 123 |
| Shields at Clyde Park, Montana | | | |
| Shoshone, Inflow to Buffalo Bill Res., Wyo. | 569 | 700 | 120 |
| Wind at Dubois, Wyoming | | 932 | 115 |
| Bull Lake near Lenore, Wyoming | | 107 | 107 |
| Tensleep near Tensleep, Wyoming | | 181 | 102 |
| Yellowstone at Miles City, Montana 5/ | | 68 | 92 |
| Missouri near Williston, N. Dakota 6/ | | | |
| PLATTE | | | |
| North Platte at Saratoga, Wyoming | | 705 | 127 |
| Laramie near Jelm, Wyoming 7/ | | 110 | 106 |
| Clear at Golden, Colorado | | 114 | 97 |
| St. Vrain at Lyons, Colorado | | 70 | 100 |
| Cache LaPoudre near Fort Collins, Colorado 8/ | | 220 | 102 |
| ARKANSAS | | | |
| Arkansas at Salida, Colorado 9/ | | 320 | 104 |
| Purgatoire at Trinidad, Colorado | | | |
| RIO GRANDE | | | |
| Rio Grande near Del Norte, Colorado 10/ | | 415 | 95 |
| Conejos near Mogote, Colorado 11/ | | 250 | 137 |
| El Vado Res. Inflow, New Mex. | | 280 | 156 |
| Rio Grande at Otowi Bridge, New Mexico 12/(Mar-July) | | 520 | 101 |
| Pecos at Pecos, New Mexico *(Mar-July) | | 33 | 80 |
| UPPER COLORADO | | | |
| Granby Res. Inflow, Col. 13/ | | 260 | 118 |
| Colorado at Dotsero, Colorado 14/ | | 1420 | 104 |
| Roaring Fork at Glenwood Springs, Colorado 15/ | | 850 | 123 |
| Gunnison at Grand Junction, Colorado 16/ | | 1340 | 118 |
| Dolores at Dolores, Colorado | | 345 | 149 |
| Colorado near Cisco, Utah 16/ ** | | 3560 | 127 |
| Flaming Gorge Res., Utah Net Inflow 17/ ** | 1061 | 1170 | 111 |
| Yampa at Steamboat Springs, Colorado | | 375 | 144 |
| White at Meeker, Colorado | | 400 | 137 |
| Duchesne near Tabiona, Utah 18/ ** | | 141 | 152 |
| Whiterocks near Whiterocks, Utah 18/ ** | | 71 | 111 |
| Scofield Reservoir, Utah, Net Inflow 19/ ** | | 60 | 187 |
| Green at Green River, Utah 17/ ** | | 3225 | 125 |
| Navajo Reservoir Inflow, New Mexico | 591 | 840 | 136 |
| Animas at Durango, Colorado | | 525 | 128 |
| San Juan near Bluff, Utah 20/ ** | | 1210 | 136 |
| Colorado, Inflow to Lake Powell, Arizona 21/ ** | 7247 | 8300 | 127 |
| LOWER COLORADO | | | |
| Gila near Solomon, Arizona (Jan.-May) | 563 | 78 | 65 |
| Salt at Intake, Arizona (Jan.-May) | 711 | 330 | 117 |
| Verde above Horseshoe Dam, Arizona (Jan.-May) | 339 | 274 | 160 |

## SELECTED STREAMFLOW FORECASTS APRIL-SEPTEMBER as of FEBRUARY 1, 1969

| STREAM AND STATION | 1000 ACRE-FEET | | PERCENT OF AVERAGE |
|---|---|---|---|
| | FLOW | FORECAST | |
| GREAT BASIN | 1968 | 1969 | 1969 |
| Bear at Harer, Idaho | 202 | 352 | 156 |
| Logan near Logan, Utah 22/ ** | 99 | 117 | 118 |
| Ogden, Inflow to Pine View Res., Utah 23/ ** | 94 | 178 | 189 |
| Weber near Oakley, Utah ** | 136 | 141 | 131 |
| Utah Lake, Utah, Net Inflow ** | | 284 | 146 |
| Big Cottonwood near Salt Lake City, Utah ** | | 44 | 129 |
| Beaver near Beaver, Utah ** | | 28 | 178 |
| South Fork Humboldt near Elko, Nevada | | | |
| Humboldt at Palisades, Nevada ** | 81 | 262 | 170 |
| Truckee at Farad, California 26/ | | | |
| East Carson near Gardnerville, Nevada | | | |
| West Walker near Coleville, California | 96 | 228 | 160 |
| UPPER COLUMBIA | | | |
| Columbia at Revelstoke, British Columbia | | | |
| Kootenai at Wardner, British Columbia | | | |
| Kootenai at Leonia, Idaho | 7901 | 10600 | 115 |
| Flathead near Polson, Montana 27/ | | | |
| Clark Fork above Missoula, Montana | | | |
| Bitterroot near Darby, Montana | | | |
| Clark Fork at Plains, Montana 27/ | | | |
| Columbia at Birchbank, British Columbia 27/ | | | |
| Spokane at Post Falls, Idaho 28/ | | 4400 | 146 |
| Columbia at Grand Coulee, Washington __/ | | 77600 | 112 |
| Okanogan near Tonasket, Washington | | | |
| Chelan at Chelan, Washington 29/ | | | |
| Wenatchee at Peshastin, Washington | | | |
| SNAKE | | | |
| Snake above Palisades Res., Wyoming 30/ | | 3160 | 123 |
| Snake near Heise, Idaho 30/ | | 4500 | 117 |
| Henry's Fork near Rexburg, Idaho 31/ | | | |
| Big Lost near Mackay, Idaho 32/ | | 300 | 180 |
| Big Wood, Inflow to Magic Res., Idaho 33/ | | | |
| Bruneau near Hot Springs, Idaho | | | |
| Owyhee Res., Net Inflow, Oregon | | 500 | 167 |
| Boise near Boise, Idaho 34/ | | 2500 | 145 |
| Malheur near Drewsey, Oregon | | 95 | 132 |
| Payette near Horseshoe Bend, Idaho 35/ | | 2750 | 153 |
| Snake at Weiser, Idaho | | | |
| Salmon at Whitebird, Idaho | | 9000 | 131 |
| Clearwater at Spalding, Idaho | | 11800 | 138 |
| LOWER COLUMBIA | | | |
| Grande Ronde at LaGrande, Oregon | | 200 | 114 |
| Yakima at Cle Elum, Washington 36/ | | | |
| Deschutes at Benham Falls, Oregon 37/ | | 552 | 93 |
| Columbia at The Dalles, Oregon 27/ | | 122000 | 116 |
| Hood near Hood River, Oregon 37/ | | 450 | 134 |
| Willamette at Salem, Oregon 37/ | | 6223 | 120 |
| Lewis at Ariel, Washington 38/ | | | |
| Cowlitz at Castle Rock, Washington | | | |

**SELECTED STREAMFLOW FORECASTS** APRIL-SEPTEMBER as of FEBRUARY 1, 1969

| STREAM AND STATION | 1000 ACRE-FEET | | PERCENT OF AVERAGE |
|---|---|---|---|
| | FLOW | FORECAST | |
| | 1968 | 1969 | 1969 |
| NORTH PACIFIC COASTAL | | | |
| Dungeness near Sequim, Washington | | | |
| Rogue at Raygold, Oregon | | 990 | 105 |
| Klamath Lake, Net Inflow, Oregon | | 775 | 125 |
| CALIFORNIA CENTRAL VALLEY 39/** | | | |
| Sacramento, Inflow to Shasta, California | 1277 | 6800 | 128 |
| Feather near Oroville, California | 1141 | 6800 | 164 |
| Yuba at Smartville, California | 568 | 3730 | 168 |
| American, Inflow to Folsom Res., Calif. | 610 | 4250 | 168 |
| Cosumnes at Michigan Bar, California | 45 | 650 | 192 |
| Mokelumne, Inflow to Pardee Res., Calif. | 241 | 1220 | 177 |
| Stanislaus, Inflow to Melones Res., Calif. | 389 | 1870 | 177 |
| Tuolumne, Inflow to Don Pedro Res., Calif. | 648 | 3150 | 181 |
| Merced, Inflow to Excheque Res., Calif. | 274 | 1710 | 191 |
| San Joaquin, Inflow to Millerton Lake, Calif. | 552 | 3140 | 194 |
| Kings, Inflow to Pine Flat Res., California | 548 | 2980 | 195 |
| Kaweah, Inflow to Terminus Res., California | 131 | 850 | 222 |
| Tule, Inflow to Success Res., California | 21 | 260 | 210 |
| Kern, Inflow to Isabella Res., California | 232 | 1290 | 200 |

*Forecasts in California provided by Department of Water Resources.*
*Average is for 1953-67 period except California. California is computed for 1916-65.*
*Forecasts assume average Effective Climate Conditions from Date Through Snow Melt Season.*

*Explanatory Notes on Forecasts listed on Inside Back Cover.*
** April - June Period ** April - July Period*

upper basin is decreased about 10 percent from a year ago, with an equivalent increase in Lake Mead. Snowmelt season inflow to Lake Powell is forecast at near 25 percent above the 1953-67 average amount.

A good water supply is assured for all parts of Arizona served by reservoir storage water. Water users on the Upper Gila river, served from natural river flow, can expect some shortages unless subsequent storms are heavier than they have been to date. Storms the last half of January materially increased the snowpack on all watersheds except the Gila. However, the rains and warm temperatures removed most low elevation snow cover. January runoff from these elevations increased storage in Salt River Project reservoirs until it is now twice average for this date. Lake Pleasant and San Carlos reservoirs contain roughly 3 to 5 times average amounts, respectively. January runoff was exceptionally heavy, as shown by the Verde river which experienced the highest January flow in 47 years. Because of the heavy runoff that has already occurred, the remaining runoff from the Verde is expected to be below average, the Salt river to be near normal.

## GREAT BASIN

With record to near record snowpacks for this time of year lying on most of its mountain watersheds, all parts of the Great Basin can look forward to excellent water supplies for next summer. However, if the snowpack continues to build as it has done during the early part of the season, some areas may experience water shortages due to high water damages to irrigation diversion structures during the spring snowmelt season.

Late January storms caused a heavy buildup of mountain snowpacks, resulting in a February 1st snowpack ranging from about 200 to 250 percent of average on watersheds of the Sierra mountains, the Lower Humboldt in Nevada, Lake County in Oregon and in parts of central and southern Utah. Typical of the heavy snowpack conditions is the fact that in some sixty years of snow surveying in Nevada the present snowpack in the Sierra mountains has been exceeded only twice on this date. Many snow courses throughout the Great Basin already equal and in some cases considerably exceed their normal April 1st accumulation.

Most streams in the Utah section of the basin are expected to flow at a third to three-fourths more than their usual amounts, with two or three times average expected from some lower elevation watersheds. Principal exception to this abnormally high streamflow outlook exists on the East Fork Sevier river in Utah, where flows are expected to be only nominally above average.

The Bear river in Wyoming, Idaho and Utah, along with the Upper Humboldt in Nevada and the streams of the Harney Basin in Oregon can also expect streamflow approaching 125 percent to 160 percent of average.

Soil moisture is generally above average and will add to the runoff to be expected from the snowpack. Reservoir storage is above average in Utah and Nevada, below average in Oregon.

## COLUMBIA BASIN

The entire United States portion of the Columbia Basin has the prospect of a good to excellent water supply next summer.

Abnormally heavy storms during January, falling on an already above normal snowpack, have set many new records for this time of year, particularly at lower elevations. Very cold temperatures during the month not only prevented a normal amount of snowmelt from low elevations and valley floors, but also resulted in excessive snowfall in areas which would ordinarily experience rain.

The mountain snowpack in many sections of Washington, Oregon and Idaho already equals or considerably exceeds the April 1st average water content.

Percentagewise, the snowpack is lightest on the upper Columbia and Kootenay rivers in British Columbia. It increases on the Okanogan and Kettle rivers to a condition more similar to that in northern Washington. The snowmelt season flow of the Columbia at The Dalles, Oregon is forecast at 116 percent of average.

The British Columbia Water Resources Service reports February 1 snow surveys show that seasonal snow accumulation is about average or a little above on the upper Columbia and Kootenay rivers, near 30 percent above average on the Okanogan river. At this early date, near average flows, or slightly above, are anticipated for the upper Columbia and its tributaries in Canada during the 1969 snowmelt season.

The mountain snowpack is well above average (130 to 150 percent) along the Continental Divide in the Blackfoot river headwaters and along the Clark Fork river near the Montana-Idaho border. The remainder of the Columbia drainage in Montana is about 10 to 30 percent above average. Present indications are for the snowmelt season runoff to be about 125 to 130 percent of normal on the Clark Fork, Blackfoot and Bitterroot rivers, about 110 to 120 percent on the Flathead river and tributaries.

The snowpack in Washington ranges from a low 118 percent to a high 277 percent. The water supply outlook for irrigation and power for the Columbia Basin in Washington and on its tributary streams is considered excellent for this time of year. Reservoir storage is essentially normal.

Watersheds of the Snake river have a snowpack which ranges from about 130 percent of average above Heise to near twice average on streams such as Henry's Fork, Big and Little Wood rivers and the Owyhee. Snowmelt season forecasts range from a low of 117 percent for the Snake at Heise to a high of 180 percent on the Big Lost river near Mackay.

Many smaller streams in Northern Idaho, such as the Palouse, Lapwai and Mission Creek have such an extremely heavy snowpack that runoff under the best conditions is expected to be damaging. Reservoir storage water in the areas which experienced last year's drought is still below normal, but the present snowpack should more than offset this deficiency and supply an excellent water supply. Total reservoir storage for the state is above average.

Oregon's snowpack follows the general pattern, varying from a low of 125 percent on the Grande Ronde to a high of 227 percent on Hood River. Reservoir storage in Oregon is below average, but part of this is due to drawdown in anticipation of heavy runoff to come. All areas in Oregon can anticipate excellent water supplies next summer.

## ALASKA

Long periods of extremely cold weather have been common throughout interior Alaska this winter. Snowfall has generally been light with most of it coming in November and early December. As a result of these conditions snow cover throughout most of Alaska is below normal.

Snow in the mountains of Southeast Alaska is near average, and considerably greater than last year at this time.

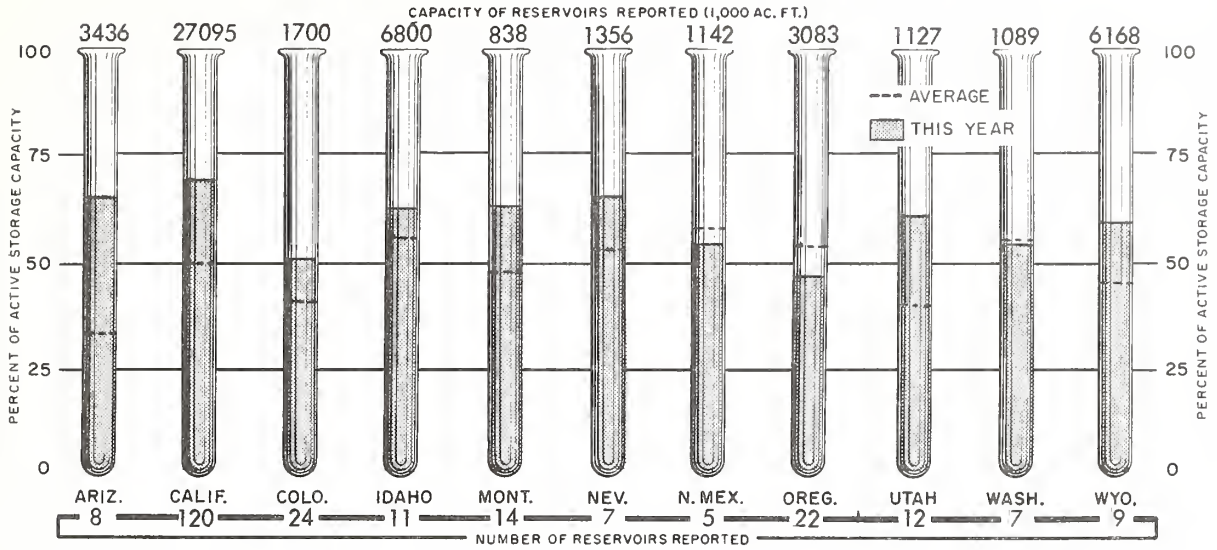
## STORAGE IN LARGE RESERVOIRS FEBRUARY 1, 1969

| BASIN AND NAME OF RESERVOIR | CAPACITY (1000A.F.) | STORAGE (1000A.F.) |
|---|---|---|
| UPPER MISSOURI | | |
| Belle Fourche | 185 | 90 |
| Boysen | 550 | 414 |
| Buffalo Bill | 373 | 188 |
| Canyon Ferry | 2043 | 1649 |
| Fort Peck | 19410 | 16210 |
| Garrison | 24500 | 19490 |
| Hebgen | 377 | 300 |
| Keyhole | 340 | 118 |
| Lake Francis Case | 5816 | 2953 |
| Lake Sharp | 1900 | 1729 |
| Oahe | 23630 | 18612 |
| Tiber | 1347 | 450 |
| Yellowtail | 1356 | 732 |
| PLATTE | | |
| City of Denver | 507 | 425 |
| Colo-Big Thompson (3) | 718 | 336 |
| Glendo | 784 | 337 |
| Pathfinder | 1016 | 336 |
| Seminoe | 1011 | 480 |
| ARKANSAS | | |
| Conchas | 280 | 121 |
| John Martin | 367 | 12 |
| RIO GRANDE | | |
| Elephant Butte | 2207 | 382 |
| El Vado | 194 | 1 |
| UPPER COLORADO | | |
| Blue Mesa | 830 | 442 |
| Flaming Gorge | 3749 | 1785 |
| Navajo | 1696 | 794 |
| Powell | 25002 | 7150 |
| LOWER COLORADO | | |
| Havusu | 619 | 531 |
| Mead | 27207 | 15441 |
| Mohave | 1810 | 1694 |
| Salt River Res. (4) | 1755 | 1492 |
| San Carlos | 1206 | 481 |
| Verde River Res. (2) | 318 | 205 |
| GREAT BASIN | | |
| Bear | 1421 | 1063 |
| Lahontan | 287 | 175 |
| Rye Patch | 172 | 27 |
| Sevier Bridge | 236 | 105 |
| Strawberry | 265 | 151 |
| Tahoe | 732 | 622 |
| Utah | 1149 | 802 |
| Willard Bay | 198 | 119 |

| BASIN AND NAME OF RESERVOIR | CAPACITY (1000A.F.) | STORAGE (1000A.F.) |
|---|---|---|
| UPPER COLUMBIA | | |
| Chelan | 676 | 254 |
| Coeur d'Alene | 225 | 134 |
| Duncan | 1347 | 502 |
| Flathead | 1219 | 1162 |
| Hungry Horse | 2982 | 2897 |
| Kootenay | 673 | 577 |
| Lower Arrow | 3083 | 1550 |
| Pend Oreille | 1155 | 591 |
| Roosevelt | 5232 | 2430 |
| Upper Arrow | 4061 | 1991 |
| LOWER COLUMBIA | | |
| Cougar | 155 | 0 |
| Detroit | 299 | 0 |
| Hills Creek | 200 | 0 |
| Lookout Point | 337 | 0 |
| Yakima Res. (5) | 1066 | 692 |
| SNAKE | | |
| American Falls | 1700 | 1282 |
| Anderson Ranch | 423 | 188 |
| Arrowrock | 287 | 275 |
| Brownlee | 980 | 766 |
| Cascade | 653 | 368 |
| Jackson | 847 | 643 |
| Lucky Peak | 278 | 55 |
| Owyhee | 715 | 307 |
| Palisades | 1202 | 1040 |
| PACIFIC COASTAL | | |
| Clair Engle | 2500 | 1473 |
| Clear Lake | 440 | 177 |
| Nacimiento | 350 | 291 |
| Ross | 1052 | 836 |
| Upper Klamath | 465 | 405 |
| CALIFORNIA CENTRAL VALLEY | | |
| Almanor | 1036 | 590 |
| Berryessa | 1602 | 1647 |
| Folsom | 1010 | 566 |
| Isabella | 570 | 252 |
| McClure | 1026 | 708 |
| Millerton | 521 | 459 |
| Oroville | 3484 | 2785 |
| Pine Flat | 1013 | 783 |
| Shasta | 4500 | 3506 |

*Reservoir Storage Data Provided by Bureau of Reclamation, Corps of Engineers, Geological Survey, and water using organizations. Data from California and British Columbia provided by Department of Water Resources and Department of Lands, Forests and Water Resources, respectively.*

# RESERVOIR STORAGE as of FEBRUARY 1, 1969




Late summer and fall precipitation was light and soils in the interior portion of the state are very dry. It is expected that the dry soil will absorb a considerable portion of water from spring snow melt.

## CALIFORNIA

The California Department of Water Resources, coordinating agency for snow surveys and water supply forecasting in California, reports that February 1 measurements indicate that the water now contained in the snowpack would provide, without subsequent precipitation, above normal April-July runoff for San Joaquin Valley tributaries and about 80 percent of normal April-July runoff from snowfed streams of the Sacramento Valley. Forecasts of runoff for the April-July period, based on normal precipitation during the remainder of the season, are 190 percent of average for the San Joaquin Valley watersheds and 150 percent of average for the Sacramento Valley streams. Statewide precipitation for the water year to date is 185 percent of normal indicating that California water users can plan for an abundant year even at this early date.

The 1968-69 season got off to a good start with near or above normal precipitation occurring over the State in October. During November and December, above normal precipitation amounts were experienced north of the Tehachapi mountains but Southern California received only 50 percent of average in each of these months. Thus, on January 1 the prospects of a good water year was in evidence with snow surveys at key courses and readings from reporting snow sensors indicating a statewide snowpack of about 130 percent of normal.

The month of January normally produces about 20 percent of the State's annual precipitation but this year should contrast sharply with that pattern. Stations throughout Central and Southern California had January totals that far exceeded their average annual amounts while, in Northern California, amounts greater than 50 percent of annual average were common. The second week of the month saw the first general storm over the State. On Saturday, the 18th, the next storm hit producing precipitation from border to border with the heaviest amounts occurring in the central portion of the State. This was a type storm that has historically been a flood producer for California, moist air being brought in by a zonal flow across the Pacific converging with a cold, northerly flow over the State. The main damage resulting from this storm was in the Southern and Central Coastal areas, although major runoff occurred in streams throughout the State. A persistent weather pattern developed after this storm which caused a series of fast moving cold storms to pass through California during the remainder of the month.

The intensity of the January storms was reflected in the high runoff volumes experienced in all regions of the State. In the coastal regions of Southern California, January flows in index streams appear incredible, exceeding 2,000 percent of normal for the month or about 275 percent of that expected during the average water year. Not only did these flows eclipse

the previous record highs for the month but they would even rank high in comparison with the greatest water year flows of record. Central California streams also experienced record or near record January flows, generally ranging between 350 and 1,000 percent of normal. Total runoff from all California watersheds during the month is estimated to be about 350 percent of normal which boosted the total runoff since October 1 to over 200 percent of normal.

Releases have been heavy in many of the major reservoirs in California in order to maintain flood control reservations. Still, on February 1, 120 of California's reservoirs were storing 18,580,000 acre-feet of water. This is 70 percent of their aggregate capacity, 135 percent of 10-year average supply and reflects a net increase during the past year of over 3,500,000 acre-feet.

# EXPLANATION of STREAMFLOW FORECASTS

All flows are observed flows except as adjusted for: 1/ Change in storage in Hebgen Lake. 2/ Change in storage in Canyon Ferry and Tiber reservoirs. 3/ Change in storage in Gibson Reservoir and measured diversions. 4/ Change in storage in Two Medicine, Four Horns and Lake Francis reservoirs. 5/ Change in storage in Boysen and Buffalo Bill reservoirs.

6/ Change in storage in Boysen, Buffalo Bill, Canyon Ferry, Tiber, and Fort Peck reservoirs. 7/ Plus diversions to Cache la Poudre. 8/ Minus diversions from North Platte, Laramie, and Colorado rivers plus measured diversions above station. 9/ Change in storage in Twin Lakes and Sugar Loaf reservoirs minus diversions from Colorado River. 10/ Change in storage in Rio Grande, Santa Maria, and Continental reservoirs.

11/ Change in storage in Platoro Reservoir. 12/ Change in storage in El Vado Reservoir. 13/ Change in storage in Granby Reservoir plus diversions to Cache la Poudre and through Adams Tunnel. 14/ Changes as indicated in (13) plus Moffat Tunnel diversion. 15/ Plus diversions to Arkansas River.

16/ Change in storage in Blue Mesa reservoir. 17/ Change in storage in Flaming Gorge, Fontenelle and Big Sandy reservoirs. 18/ Plus diversion through Duchesne Tunnel. 19/ Change in storage in Scofield Reservoir. 20/ Change in storage in Navaho Reservoir.

2 21/ (Lee's Ferry) Change in storage in Flaming Gorge, Navajo, Lake Powell and Big Sandy reservoirs. 22/ Plus Utah Power and Light Company tailrace and and Logan, Hyde Park, and Smithfield canals. 23/ (Inflow record computed by U. S. Bureau of Reclamation.) 24/ Plus diversion by Weber-Provo Canal and change in storage in Wanship Reservoir. 25/ Change in storage in Deer Creek Reservoir, minus diversions through Duchesne Tunnel and Weber-Provo Canal, plus diversion through Salt Lake City Aqueduct.

26/ Change of storage in Lake Tahoe and Boca Reservoir. (Forecast by Truckee Basin Committee) 27/ Change in storage in any of these reservoirs above the station: Kootenai Lake, Hungry Horse, Flathead Lake, Pend Oreille Lake, F. D. Roosevelt Lake, Lake Chelan, Coeur d'Alene Lake, Brownlee and Noxon; and pumpage at Roosevelt Lake. 28/ Changes in storage in Coeur d'Alene Lake and diversions by Spokane Valley Farms Company and Rathdrum Prairie canals. 29/ Change in storage in Lake Chelan. 30/ Changes in storage for Jackson Lake and Palisades Reservoir above stations. 30/

31/ Change in storage in Henry's Lake, Island Park and Grassy Lake reservoirs and diversions between Ashton and Rexburg. 32/ Change in storage in Mackay Reservoir, and diversion in Sharp Ditch. 33/ (Combined flow Big Wood River nr. Bellevue and Camas Creek nr. Blaine.) 34/ Change in storage in Arrowrock, Anderson Ranch, and Lucky Peak. 35/ Change in storage in Cascade and Deadwood reservoirs. 36/ Change in storage in Keechelus, Kachess, and Cle Elum reservoirs plus diversion by Kittitas Canal. 37/ (Corrected to natural flow). 38/ Change in storage in Merwin, Yale, and Swift reservoirs. 39/ (Corrected for upstream impairments).

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